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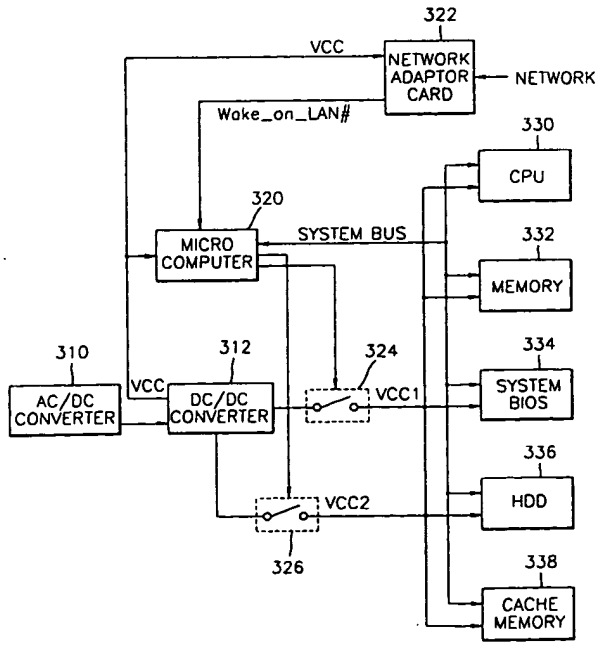
(54) Method and apparatus for controlling power of a computer system on a Lan (local area network)

(57) A method for controlling power of a computer system using a wake on local area network (LAN) signal and an apparatus therefor are provided. The method includes the steps of powering devices other than predetermined peripheral apparatuses sensible to power on/off, when the wake on LAN signal is sensed in the power-off state of the computer system, checking power on enable or disable in wake on LAN enable from the system setup state during booting of the computer, and powering on the predetermined peripheral apparatuses if a system is set to power on enable, and powering off the devices powered on in the step of checking power on enable or disable if not.

FIG. 3



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Description

[0001] The present invention relates in general to power control of a computer, and more particularly, to method and apparatus for controlling the power of a computer using a wake on local area network (LAN) signal generated by a network administrator of a computer network.

[0002] Figure 1 is a schematic view of a typical computer network. Here, a network administrator 100 is connected to a plurality of computers 110, 112, 114, ... corresponding to terminals. For example, adjacent computers in an office or in a building are connected to each other by a local area network (LAN) to share various resources.

[0003] A method for remotely controlling the power of a computer is desired to enable easy management of computers and reduce the maintenance cost of the computer. That is, even when a computer is powered off by a user, the computer can be remotely powered on automatically by the network administrator 100 at a predetermined time. The powered off system is remotely awakened and then booted by the wake on LAN signal in accordance with a wire management specification.

[0004] Figure 2 is a block diagram of a system power switching apparatus in accordance with a conventional wake on LAN signal. The computer system having an AC-to-DC converter 210, a DC-to-DC converter 212, a CPU 230, a memory 232, a system bios 234, a hard disk drive (HDD) 236 and a cache memory 238 further includes a chipset 220, a switch 224 and a network adaptor card 222 which are for automatic power-on in accordance with a wake on LAN signal.

[0005] Referring to Figure 2, even if the system is powered off, i.e., even if all devices in the computer system are turned off by switching off the switch 224, the chipset 220 and the network card 222 are supplied with power from the DC-to-DC converter 212 to be in a sleep mode in which little power is consumed. Here, the DC-to-DC converter 212 is in an enable state until the power-cord of a computer is pulled out of an electrical socket by a user. When the system is powered off and a wake on LAN signal is input through the network card 222, the chipset 220 automatically turns on the switch 224 to power on the system. That is, the chipset 220 automatically switches the power of the system on or off in accordance with the wake on LAN signal.

[0006] However, when the system is powered on by the chipset 220, there are problems as follows. The chipset has to support a sleep mode, and can operate due to waking by the wake on LAN signal. In other words, the wake on LAN function is entirely performed by the chipset, so that undesired powering on of a computer cannot be prevented.

[0007] Also, when the power of the system is completely off, and then power is again supplied, the system is awakened to check the setup state of the current system. At this time, even if the chipset 220 automatically powers the system on in accordance with the wake on LAN signal, the system is again powered off when power-on in accordance with the wake on LAN function is not set in the checked system setup state. As described above, when the power of the system is repeatedly turned on or off by an undesired power-on, the state of a predetermined apparatus such as a hard disk driver may become very unstable.

[0008] It is an aim of the present invention to provide a method for controlling the power of a computer system using a wake on LAN signal, where power disruption for an apparatus such as a hard disk is minimised.

[0009] It is another aim of the present invention to provide an apparatus for controlling the power of the computer system using a wake on LAN signal.

[0010] It is still another aim of the present invention to provide a method for controlling the power of a computer system avoiding an undesired wake on LAN signal.

[0011] According to the present invention there is provided a method for controlling power of a computer system as set forth in claim 1 or 4 appended hereto. Also according to the present invention there is provided an apparatus for controlling power of a computer system as set forth in claim 2 appended hereto. Preferred features of the invention will be apparent from the dependent calims and the description which follows.

[0012] According to a first aspect of the present invention there is provided a method for controlling the power of a computer system using a wake on LAN signal including the steps of: (a) powering devices other than predetermined peripheral apparatuses sensible to power on/off, when the wake on LAN signal is sensed in the power-off state of the computer system; (b) checking power on enable or disable in wake on LAN enable from the system setup state during booting of the computer; and (c) powering on the predetermined peripheral apparatuses if a system is set to power on enable, and powering off the devices powered on in step (a) if not.

[0013] According to a second aspect of the present invention, there is provided an apparatus for controlling the power of a computer system using a wake on LAN signal including: a power controlling unit generating a first control signal when the wake on LAN signal is sensed, and generating a second control signal in accordance with the setup state of the system; a first switch connected to a predetermined power supply, and supplying the power to devices of the system other than predetermined peripheral apparatuses sensible to powering on and off in response to the first control signal; and a second switch supplying power to the peripheral apparatuses in response to the second control signal.

[0014] Preferably, the power controlling unit receives a power on enable/disable command with respect to the wake on LAN signal set in accordance with setup state of the system from a CPU before powering the system off, and regards the system to be power on enable to generate the first control signal when it doesn't receive information on the wake on LAN, and generates the sec-

ond control signal when the power on enable is checked from the system setup state during booting of the computer.

[0015] According to a third aspect of the present invention, there is provided a method for controlling power of a computer system using a wake on LAN signal including the steps of (a) setting the power on enable or disable in wake on LAN enable, (b) checking information on the wake on LAN set in step (a), when the wake on LAN signal is sensed in the power-off state of the computer system, (c) powering on the computer system when the system is set to the power on enable state powering off the computer system if not, and (d) powering on the computer system when the information on the wake on LAN is not checked in step (b).

[0016] For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

Figure 1 is a schematic view of a typical computer network;

Figure 2 is a block diagram of a system power switching apparatus in accordance with a conventional wake on LAN signal;

Figure 3 is a block diagram of an apparatus for controlling system power using a wake on LAN signal according to the present invention;

Figure 4 is a flowchart for illustrating a preferred embodiment of a method for controlling system power using a wake on LAN signal according to the present invention; and

Figure 5 is a flowchart for illustrating another preferred embodiment of a method for controlling system power using a wake on LAN signal according to the present invention.

[0017] Referring to Figure 3 a preferred computer system is shown comprising an AC-to-DC converter 310, a DC-to-DC converter 312, a CPU 330, a memory 332, a system bios 334, a hard disk drive (HDD) 336 and a cache memory 338. Suitably, the computer system includes a power controller comprising a micro computer 320, a network card 322, a first switch 324 and a second switch 326 which are for controlling the power of a system using a wake on LAN signal.

[0018] The micro computer 320 is always supplied with power from the DC-to-DC converter 312 regardless of the computer being in a power-off-state. In use the microcomputer 320 senses a signal change by connecting one input pin to the wake on LAN signal line of the network card 322, and controls the first and the second switches 324 and 326 which form a power supply switching portion. Also, the micro computer 320 is connected to a computer system such as the CPU 330, the memory 332 and the system bios 334 through a system bus, and receives a predetermined command with respect to the wake on LAN signal from the CPU 330.

[0019] The network card 322 is supplied with power from the DC-to-DC converter 312 regardless of the system being in a power off state like the micro computer 320. Here, the DC-to-DC converter 312 is in an enabled state until a power supply plug is pulled out of the socket. The first switch 324 supplies power from the DC-to-DC converter 312 to a first set of devices, other than predetermined apparatuses such as the HDD 336, under the control of the micro computer 320, and the second switch 326 supplies power to a second set of devices such as the HDD 336.

[0020] The operation will be described with reference to Figure 3. Even when the power of the system is off, that is, all components of the computer system are off by turning off the first and the second switches 324 and 326, the micro computer 320 and the network card 322 are supplied with power of the DC-to-DC converter 312 to be in a sleep mode in which little power is consumed.

[0021] The micro computer 320 receives a power on enable/disable command with respect to the wake on LAN signal from the CPU 330 before entering the sleep mode state. That is, a menu of the wake on LAN enable is preset by a user before power-off, and then the CPU 330 commands the power on enable/disable in accordance with the system set-up state to the micro computer 320.

[0022] When the wake on LAN signal is sensed through the network card 322, after the micro computer 320 is in a sleep mode, the micro computer 320 checks preset information even though the wake on LAN is enabled. Then, when the micro computer 320 is not set to the power-on enable by checking preset information, the system is not powered on. However, when the micro computer 320 is set to the power-on enable state by checking preset information, control signals are generated in the first and the second switches 324 and 326 to power the system on.

[0023] Meanwhile, when there is no information on the wake on LAN function, the micro computer 320 is determined to be in a power-on enable state by default, to thereby automatically power on the system. That is, when no commands are received from the CPU 330 before the micro computer 320 is in the sleep mode, the system is powered on.

[0024] At this time, the micro computer 320 supplies power from the DC-to-DC converter 312 to devices other than predetermined apparatuses as such as the hard disk drive 336 by turning on the first switch 324. When the CPU 330 determines the current system setup state using a CMOS RAM after booting the computer, and thus the system is set to power on disable in the wake on LAN enable, the CPU 330 commands the micro computer 320 to power the system off.

[0025] Also, in order to prevent power from being applied to a predetermined apparatus such as the hard disk drive 336 before the system is powered off by the CPU 330, the system bios 334 controls the power on/off of the hard disk drive 336. The system bios 334 checks the current setup state. When the system is set to be power-on disable in the wake on LAN enable state, the CPU 330 commands the micro computer 320 to power the system off. However, when the system is set to power-on enable, the CPU 330 commands the micro computer 320 to turn on the second switch 326, to thereby supply power to a predetermined apparatus such as the hard disk drive 336.

[0026] A method for controlling power will be described in a preferred embodiment of the apparatus for controlling the power of the computer system.

[0027] Referring to Figure 4, a menu of a wake on LAN enable is set by a user (step 400). That is, on a system setup the menu of the wake on LAN enable can be set by a user, and whether the power on is enabled or disabled during the wake on LAN enable is determined. After step 400, the CPU commands the micro computer power on enable/disable before powering the system off, i.e., the CPU commands the power controller for sensing the wake on LAN signal and controlling the power of the system (step 402).

[0028] When the computer system is powered off after determining power on enable or disable for the wake on LAN signal through steps 400 and 402, it is checked whether the wake on LAN is enabled or not. When the wake on LAN signal is sensed in the power off state, the information on the wake on LAN in the micro computer is checked (step 406).

[0029] It is determined whether the system is set up by the power on enable or not (step 408). When the system is set up to power on enable, the computer system is powered on (step 410). If the system is set up to power on disable, the computer system is not powered on regardless of the sensed wake on LAN signal (step 412).

[0030] Here, when the micro computer is not commanded by the CPU, the information on the predetermined wake on LAN may not be checked in step 406. At this time, the power on enable is set by default, and the computer system is automatically powered on. Other embodiments may be proposed as follows.

[0031] Referring to Figure 5, it is checked whether the wake on LAN signal is sensed according to the wake on LAN enable in the power off state of the computer system (step 500). When the micro computer senses the wake on LAN signal, it is checked whether there is information on the wake on LAN commanded (step 502). When there is information, it is determined whether the system is set up to power on enable in wake on LAN enable (step 504). If the system is set up to power on enable, the computer system is powered on (step 506), and if not, the computer is not powered on (step 508).

[0032] However, if there is no information on the wake on LAN commanded in step 502, the system is regarded to be set as power on enable (step 510). Power is supplied to devices other than predetermined apparatuses such as the hard disk drive sensible to the power-on/off (step 512). During booting of the computer, the power on enable or disable with respect to the wake on LAN in the system bios is checked (step 514).

[0033] It is determined whether the system is set up to power on enable in the wake on LAN enable (step 516). If so, power is supplied to the predetermined apparatus such as the hard disk drive (step 518). However, when the system is set up to power on disable, the powered-on devices in step 512 are again powered off (step 520).

[0034] As described above, according to the apparatus and the method for controlling system power using the wake on LAN signal, the wake on LAN function is provided regardless of the chipset, and the system can be prevented from being powered on due to an undesired wake on LAN signal, and damage to the hard disk drive influenced by the power-on/off can be prevented.

[0035] The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0036] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0037] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0038] The invention is not restricted to the details of the foregoing embodiment(s). The invention extend to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A method for controlling power of a computer system using a wake on local area network (LAN) signal, comprising the steps of:

   (a) powering devices other than predetermined peripheral apparatuses sensible to power on/off, when the wake on LAN signal is sensed in the power-off state of the computer system;

(b) checking power on enable or disable in wake on LAN enable from the system setup state during booting of the computer; and

(c) powering on the predetermined peripheral apparatuses if a system is set to power on enable, and powering off the devices powered on in step (a) if not.

2. An apparatus for controlling power of a computer system using a wake on LAN signal, comprising:

a power controlling unit (320) for generating a first control signal when the wake on LAN signal is sensed, and generating a second control signal in accordance with the setup state of the system;

a first switch (324) connected to a predetermined power supply, for supplying power to devices of the system other than predetermined peripheral apparatuses sensible to powering on and off in response to the first control signal; and

a second switch (326) for supplying power to the peripheral apparatuses in response to the second control signal.

3. The apparatus of claim 2, wherein the power controlling unit (320) receives a power on enable/disable command with respect to the wake on LAN signal set in accordance with setup state of the system from a CPU before powering the system off, and regards the system to be power on enable to generate the first control signal when it doesn't receive information on the wake on LAN, and generates the second control signal when the power on enable is checked from the system setup state during booting of the computer.

4. A method for controlling power of a computer system using a wake on LAN signal, comprising the steps of:

(a) setting the power on enable or disable in wake on LAN enable;

(b) checking information on the wake on LAN set in step (a), when the wake on LAN signal is sensed in the power-off state of the computer system;

(c) powering on the computer system when the system is set to the power on enable state powering off the computer system if not; and

(d) powering on the computer system when the information on the wake on LAN is not checked in step (b).

FIG. 1 (PRIOR ART)

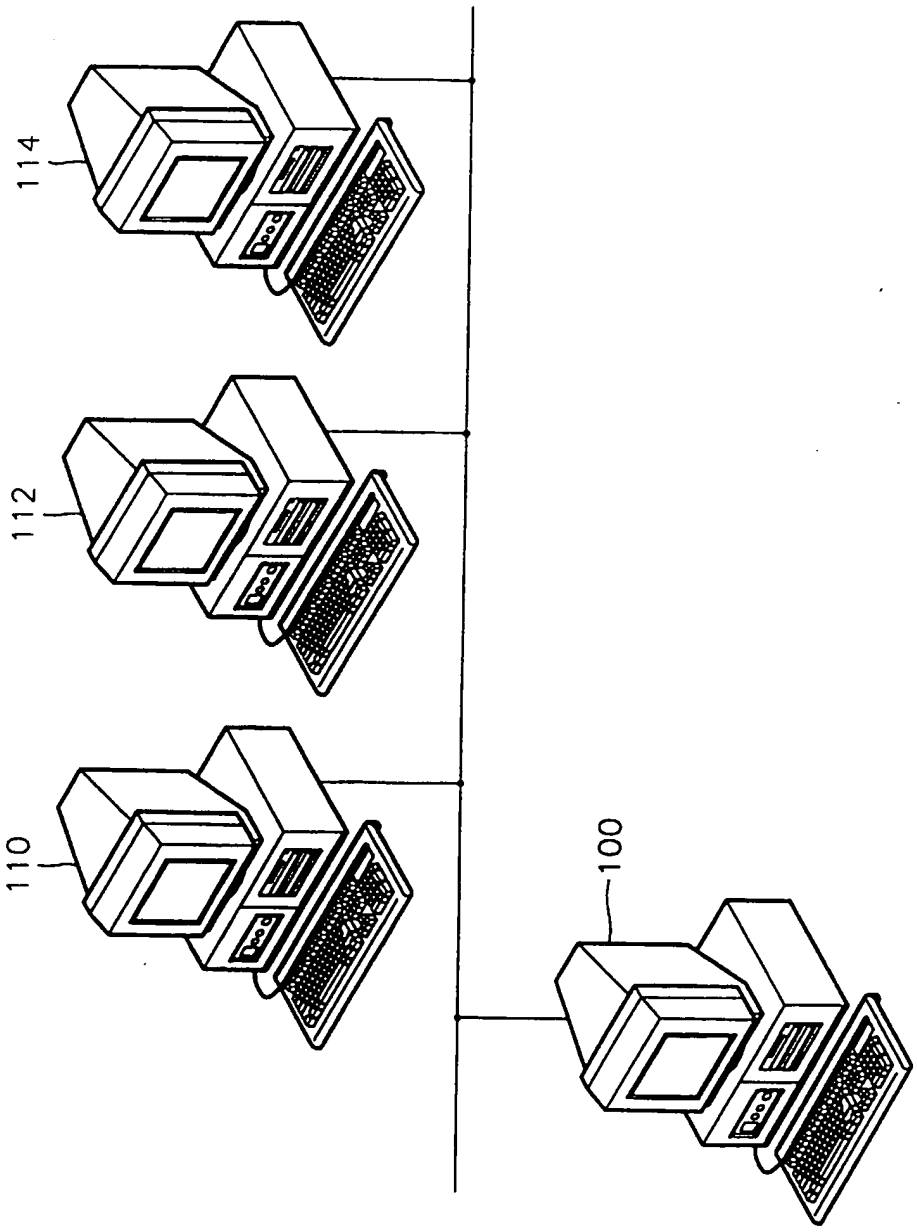


FIG. 2 (PRIOR ART)

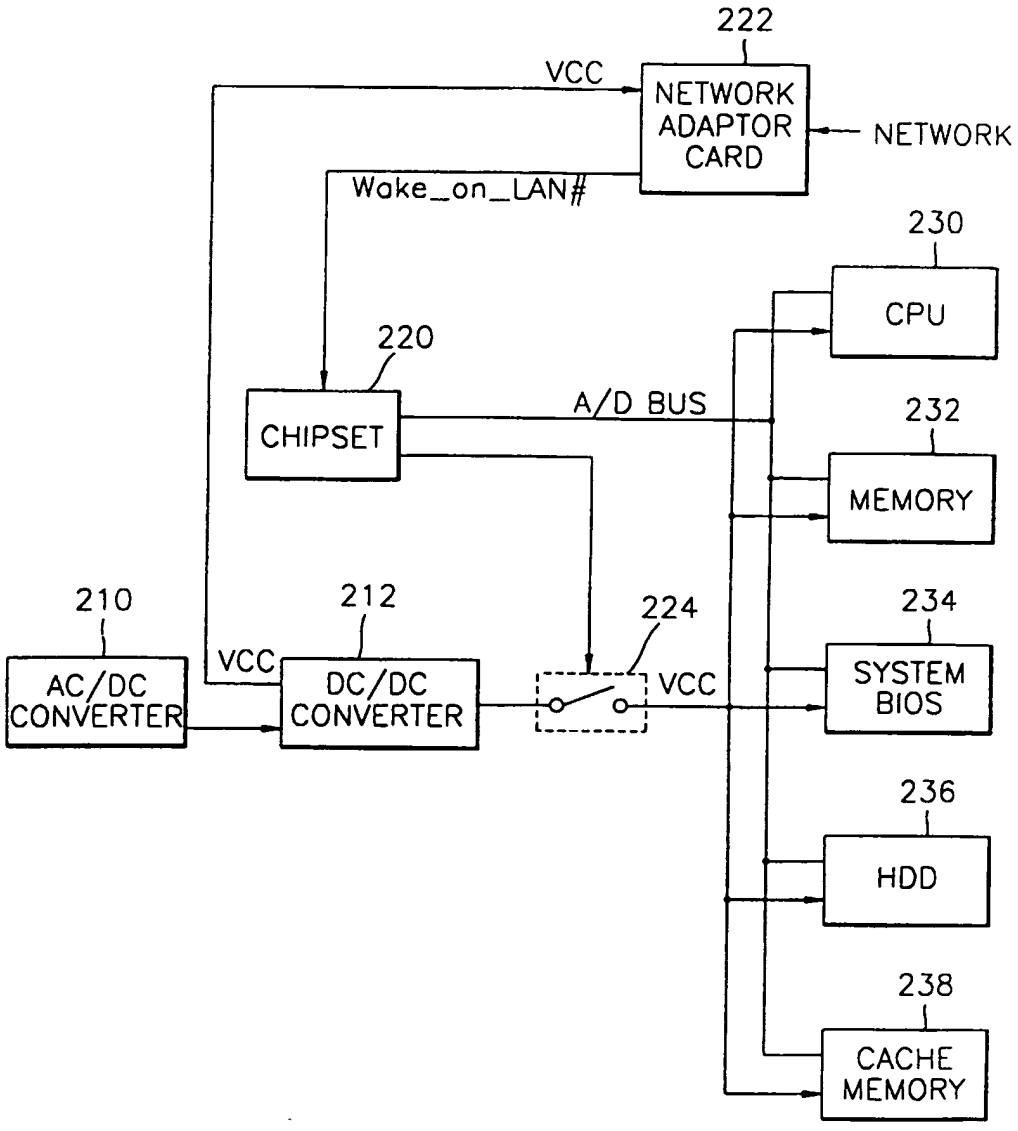


FIG. 3

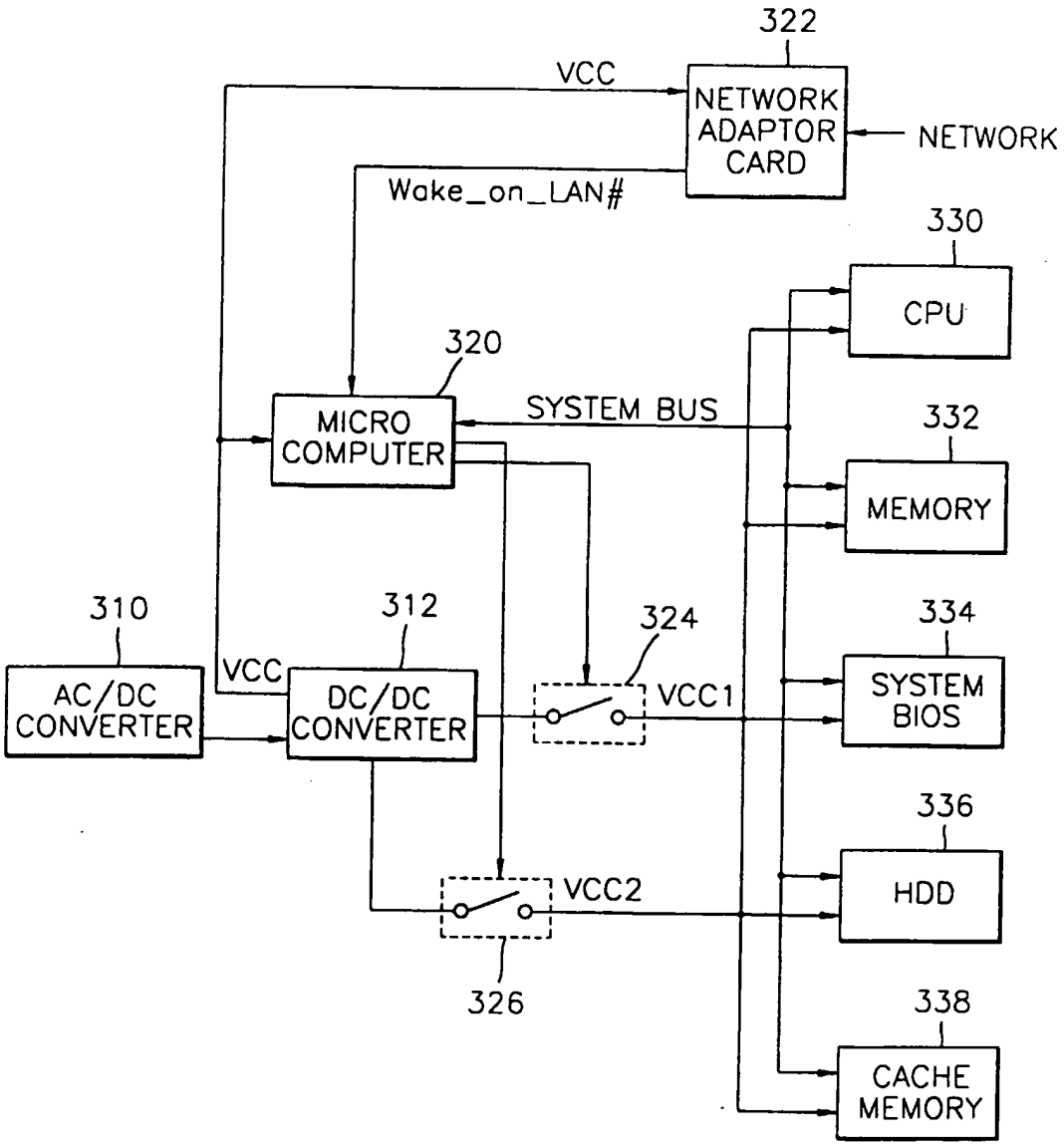

322
VCC
NETWORK ADAPTOR CARD
NETWORK
Wake_on_LAN#
330
CPU
320
MICRO COMPUTER
SYSTEM BUS
332
MEMORY
310
312
324
334
AC/DC CONVERTER
VCC
DC/DC CONVERTER
VCC1
SYSTEM BIOS
336
VCC2
HDD
326
338
CACHE MEMORY

FIG. 4

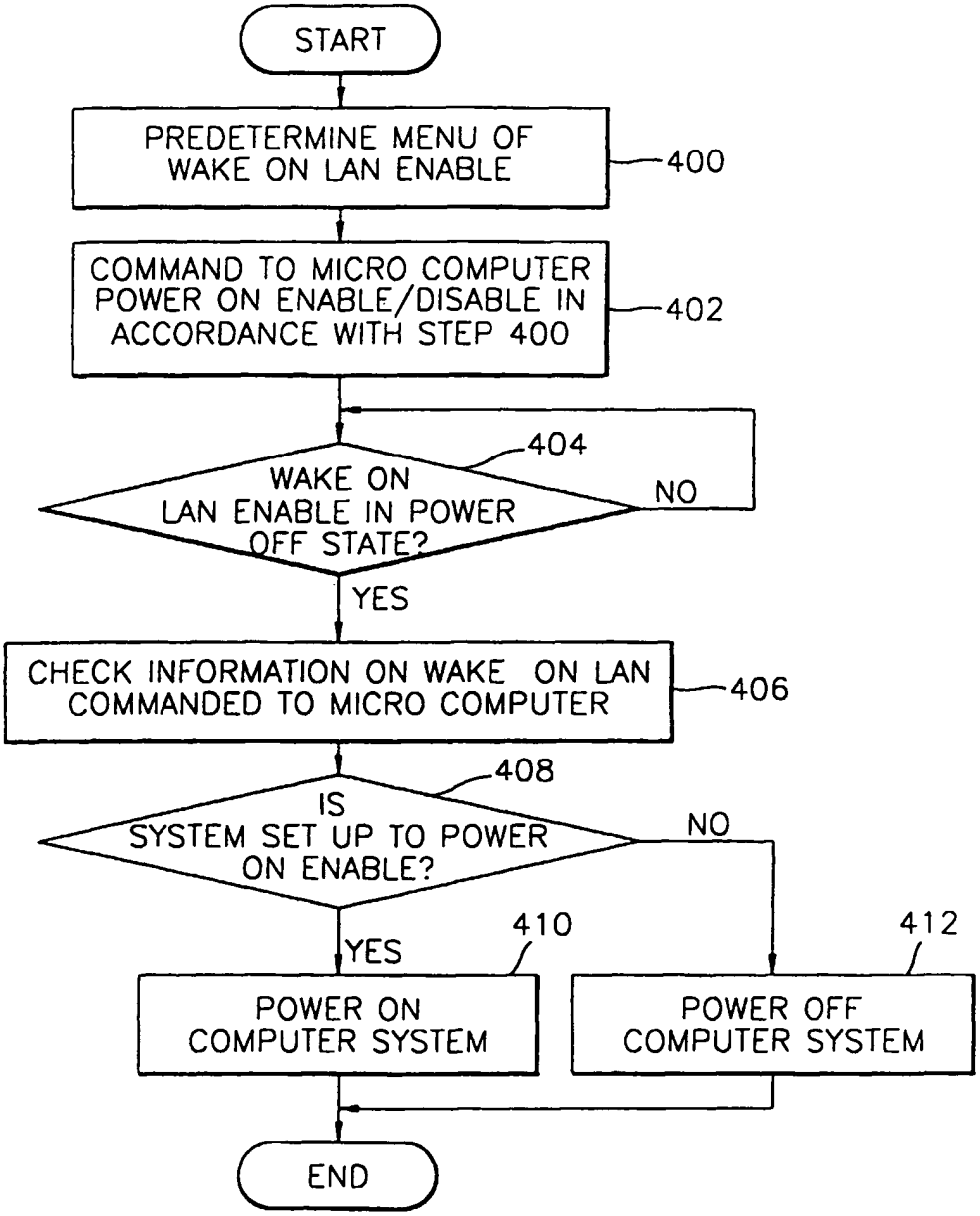
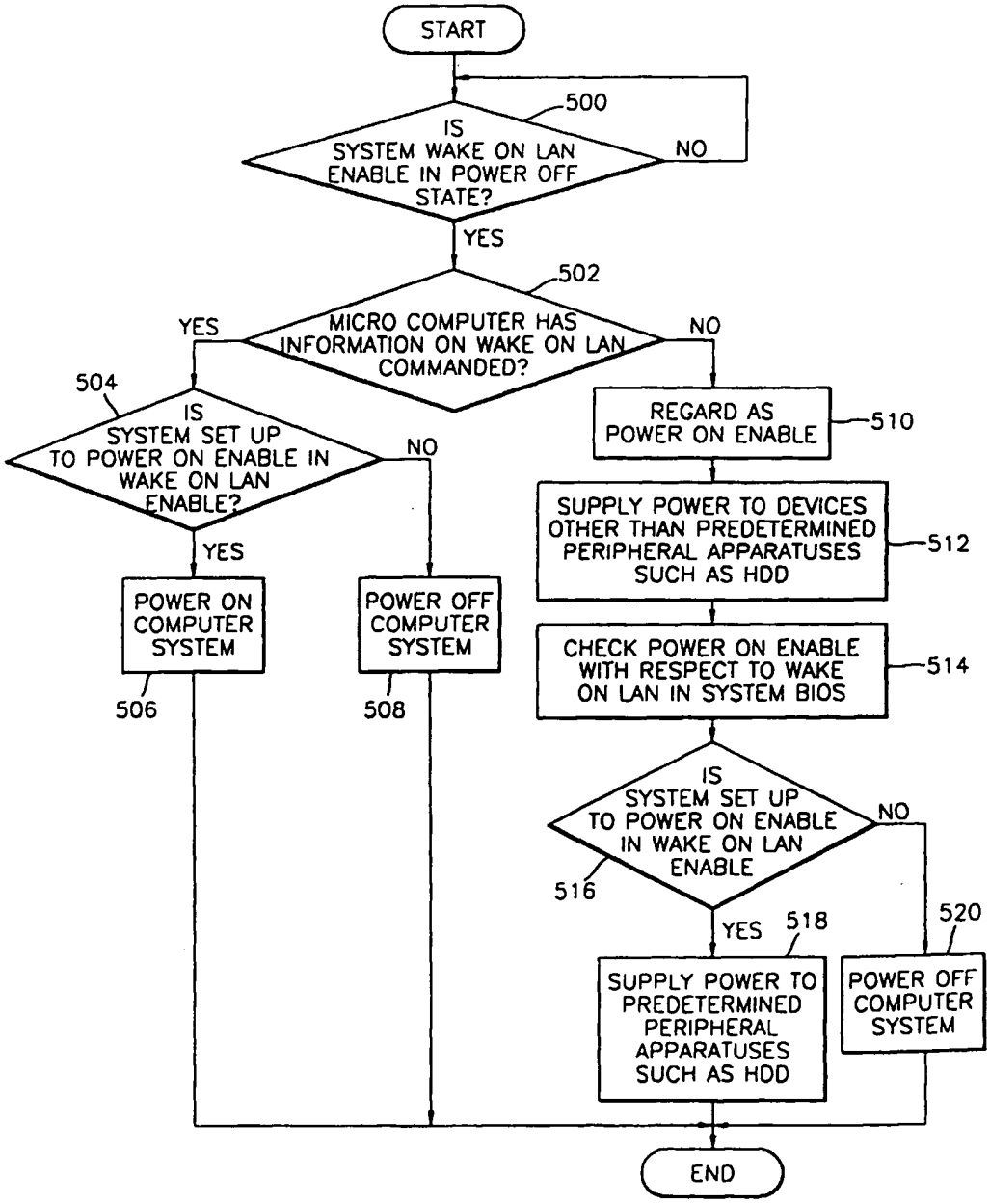

START
PREDETERMINE MENU OF WAKE ON LAN ENABLE
400
COMMAND TO MICRO COMPUTER POWER ON ENABLE/DISABLE IN ACCORDANCE WITH STEP 400
402
404
WAKE ON LAN ENABLE IN POWER OFF STATE?
NO
YES
CHECK INFORMATION ON WAKE ON LAN COMMANDED TO MICRO COMPUTER
406
408
IS SYSTEM SET UP TO POWER ON ENABLE?
NO
YES
410
412
POWER ON COMPUTER SYSTEM
POWER OFF COMPUTER SYSTEM
END

FIG. 5


START
500
IS SYSTEM WAKE ON LAN ENABLE IN POWER OFF STATE?
NO
YES
502
MICRO COMPUTER HAS INFORMATION ON WAKE ON LAN COMMANDED?
YES
NO
504
IS SYSTEM SET UP TO POWER ON ENABLE IN WAKE ON LAN ENABLE?
NO
YES
POWER ON COMPUTER SYSTEM
506
POWER OFF COMPUTER SYSTEM
508
REGARD AS POWER ON ENABLE
510
SUPPLY POWER TO DEVICES OTHER THAN PREDETERMINED PERIPHERAL APPARATUSES SUCH AS HDD
512
CHECK POWER ON ENABLE WITH RESPECT TO WAKE ON LAN IN SYSTEM BIOS
514
IS SYSTEM SET UP TO POWER ON ENABLE IN WAKE ON LAN ENABLE
516
NO
YES
518
SUPPLY POWER TO PREDETERMINED PERIPHERAL APPARATUSES SUCH AS HDD
520
POWER OFF COMPUTER SYSTEM
END